IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 5, December 2025
Impact Factor: 7.67

Development and ISO/IEC 25010 Evaluation of a Web-Based Automotive Laboratory Inventory and Resource Management System for Higher Education

Virgilio J. Sandrijo
College of Business Technology, Department of Automotive Technology,
Surigao Del Norte State University, Philippines

Abstract: *Effective laboratory resource management is essential for ensuring the availability, accountability, and efficient utilization of tools, equipment, and consumable materials in Automotive Technology education. However, the Bachelor of Science in Automotive Technology program at Surigao del Norte State University relied on manual inventory practices, resulting in inefficient inventory monitoring, inconsistent records, delayed report generation, and difficulty in tracking laboratory resources. This study aimed to develop and evaluate a Web-Based Automotive Laboratory Inventory and Resource Management System to improve laboratory inventory operations. Specifically, it sought to determine the functional and operational requirements of the proposed system, develop a web-based application, evaluate its software quality using the ISO/IEC 25010 Software Quality Model, and determine its level of acceptability among intended users. The study employed a Design and Development Research (DDR) methodology consisting of requirements analysis, system design, system development and implementation, and system evaluation. The developed system integrated modules for user authentication, dashboard, inventory management, equipment management, borrowing and return management, stock-in and stock-out monitoring, supplier management, report generation, and user account management. Evaluation results revealed that the system achieved an overall mean score of 4.79 (SD = 0.33), interpreted as Excellent, indicating compliance with the ISO/IEC 25010 software quality characteristics. Moreover, the system obtained an overall mean acceptability rating of 4.86 (SD = 0.28), interpreted as Highly Acceptable, demonstrating its usefulness, ease of use, efficiency, and user satisfaction. The findings indicate that the developed system effectively improves inventory management, enhances operational efficiency, strengthens accountability, and supports better laboratory resource utilization. The study concludes that the proposed system is a reliable and effective solution for modernizing automotive laboratory inventory management in higher education institutions.*

Keywords: Automotive laboratory, inventory management system, resource management, web-based system, ISO/IEC 25010, design and development research, higher education.

I. INTRODUCTION

The effective management of laboratory resources is fundamental to the delivery of competency-based education in automotive technology. Practical laboratory instruction requires the continuous availability of tools, equipment, training modules, spare parts, and consumable materials to support students in acquiring technical competencies aligned with industry standards. However, many higher education institutions continue to rely on manual inventory procedures or spreadsheet-based records, resulting in inaccurate inventory data, inefficient resource utilization, delayed procurement, equipment loss, and difficulties in monitoring laboratory assets. These challenges may adversely affect laboratory operations and the overall quality of technical education (Odasco & Saong, 2023).

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

Recent studies have emphasized that digital inventory management systems significantly improve inventory accuracy, asset traceability, operational efficiency, and accountability through the automation of inventory recording, stock movement monitoring, barcode integration, and report generation (Cortez et al., 2024; Wulandari & Rahman, 2026). In laboratory environments, digital inventory systems likewise facilitate equipment borrowing, maintenance scheduling, audit trail generation, and real-time monitoring of laboratory resources, thereby reducing administrative workload while supporting evidence-based decision-making.

The increasing adoption of digital transformation initiatives in higher education has encouraged universities to modernize laboratory management practices through integrated information systems. Effective inventory management not only ensures the availability of instructional resources but also enhances institutional governance, financial accountability, and resource optimization. Digital inventory platforms enable laboratory personnel to efficiently monitor equipment utilization, forecast procurement requirements, and maintain complete inventory records that support accreditation, quality assurance, and operational planning (Ramos-Miller, 2023).

Within the Bachelor of Science in Automotive Technology program at Surigao del Norte State University, laboratory activities involve extensive utilization of automotive tools, diagnostic equipment, engines, transmission trainers, electrical training boards, measuring instruments, spare parts, and various consumable materials. The absence of a dedicated laboratory inventory management platform may result in inconsistent inventory records, inefficient equipment borrowing procedures, limited monitoring of stock availability, and delayed report preparation. These operational concerns highlight the need for a centralized web-based system capable of integrating inventory management, laboratory asset monitoring, equipment borrowing, stock movement tracking, and automated report generation.

To address these operational challenges, this study proposes the development of a Web-Based Automotive Laboratory Inventory and Resource Management System specifically designed for the Bachelor of Science in Automotive Technology program of Surigao del Norte State University. The system is expected to automate inventory transactions, improve laboratory resource utilization, strengthen accountability through role-based access control, facilitate preventive maintenance scheduling, and generate real-time inventory reports that support laboratory administration and instructional management.

The developed system will be evaluated using the ISO/IEC 25010 software product quality model, which assesses functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. Employing internationally recognized software quality standards ensures that the developed application is systematically evaluated for its readiness, effectiveness, and suitability for implementation in higher education laboratory environments.

II. REVIEW OF RELATED LITERATURE

A. Digital Inventory Management Systems in Educational Laboratories

The digital transformation of laboratory operations has become a significant priority among higher education institutions due to the increasing need for efficient resource utilization, accountability, and operational transparency. Traditional paper-based inventory systems often result in inaccurate records, misplaced equipment, delayed inventory updates, and time-consuming report generation. Consequently, educational institutions have begun implementing web-based inventory management systems that automate inventory recording, equipment monitoring, and report generation. These systems significantly reduce manual errors while improving inventory accuracy and laboratory administration (Cortez et al., 2024). Furthermore, digital inventory systems enhance decision-making by providing real-time information regarding laboratory resources, allowing administrators to plan procurement activities more effectively and maintain sufficient instructional materials for laboratory courses.

B. Web-Based Inventory Systems

Several studies have demonstrated that web-based inventory systems provide greater accessibility, centralized data management, and improved operational efficiency compared with traditional inventory methods. Since inventory records are stored in centralized databases, authorized users can access inventory information from different locations

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

through secured network connections. Web technologies likewise facilitate faster report generation, efficient stock monitoring, and easier maintenance of inventory records. The integration of database technologies with web applications enables organizations to minimize redundant data entry while improving inventory consistency and data integrity (Tanaman et al., 2023).

C. Laboratory Inventory Management Systems

Laboratory environments require systematic monitoring of laboratory tools, equipment, chemicals, consumables, and instructional resources. Cortez et al. (2024) developed a Laboratory Inventory Management System (LIMS) that incorporated barcode handling, audit management, document management, inventory and equipment management, and stock quality assurance. Their findings indicated that laboratory personnel benefited from improved traceability of equipment, faster inventory transactions, and reduced human errors through barcode technology. The researchers further emphasized that integrated laboratory inventory systems strengthen accountability while supporting institutional quality assurance initiatives.

D. ISO/IEC 25010 in Software Evaluation

The ISO/IEC 25010 software quality model has become one of the most widely accepted standards for evaluating software systems developed in academic institutions. The model evaluates software based on eight quality characteristics: functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability. Recent software development studies consistently utilize ISO/IEC 25010 because it provides internationally recognized criteria for determining software quality and user satisfaction. Applying this standard ensures that developed systems satisfy both technical requirements and user expectations before deployment.

E. Barcode Technology in Inventory Management

Barcode technology has become an essential component of modern inventory systems because it significantly accelerates inventory transactions while minimizing manual encoding errors. Instead of manually searching inventory records, users simply scan barcode labels to retrieve equipment information, update stock quantities, or record borrowing transactions. Previous studies have shown that barcode integration improves inventory accuracy, decreases transaction processing time, and strengthens accountability for laboratory assets. Such technology is particularly beneficial in educational laboratories where numerous students borrow tools and equipment daily.

F. Inventory Monitoring and Decision Support

Effective inventory monitoring contributes significantly to organizational efficiency by ensuring that sufficient materials remain available for operational requirements while avoiding excessive inventory accumulation. Inventory monitoring systems automatically record stock movement, identify low-stock items, and generate replenishment reports that assist administrators in procurement planning. Automated monitoring also reduces stock shortages, minimizes unnecessary purchases, and improves financial management through accurate inventory records. These capabilities support institutional sustainability by promoting efficient utilization of available resources.

G. Resource Management in Higher Education

Universities increasingly recognize the importance of digital resource management in supporting instructional delivery, accreditation compliance, and institutional governance. Proper management of laboratory resources allows faculty members to monitor equipment utilization, schedule maintenance activities, and document laboratory asset conditions. Digital resource management also strengthens transparency by maintaining comprehensive audit trails of equipment borrowing, return, and maintenance history. These practices contribute to better laboratory administration and improve the overall learning environment for students.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

H. Automation of Laboratory Operations

Automation has transformed laboratory operations by reducing repetitive administrative tasks and improving operational productivity. Automated inventory systems eliminate repetitive manual encoding, facilitate rapid retrieval of inventory information, and simplify report generation. As a result, laboratory personnel devote more time to instructional support and laboratory supervision instead of administrative documentation. Recent studies have consistently reported that automation enhances operational efficiency and improves user satisfaction in educational institutions.

I. Automotive Technology Laboratory Management

Automotive Technology laboratories require specialized management because they maintain diverse instructional resources including engines, transmissions, electrical trainers, diagnostic instruments, measuring tools, and consumable automotive parts. Unlike ordinary classrooms, automotive laboratories experience frequent borrowing, replacement, and maintenance of instructional equipment. Consequently, implementing a web-based inventory management system provides an effective mechanism for monitoring laboratory assets, preventing equipment loss, and ensuring the availability of instructional resources during laboratory sessions. The concepts demonstrated in recent laboratory inventory management studies can therefore be adapted to Automotive Technology laboratories in higher education institutions.

J. Synthesis of Literature

The reviewed literature consistently demonstrates that digital inventory management systems significantly improve inventory accuracy, operational efficiency, laboratory accountability, and institutional resource management. Previous studies primarily focused on general laboratory environments, business establishments, and engineering laboratories. However, limited studies have specifically addressed inventory management systems designed for Automotive Technology laboratories in higher education. This gap provides a strong opportunity for the present study to develop and evaluate a Web-Based Automotive Laboratory Inventory and Resource Management System for the Bachelor of Science in Automotive Technology program at Surigao del Norte State University. The proposed system is expected to contribute to laboratory modernization by integrating inventory monitoring, equipment borrowing, stock management, and ISO/IEC 25010-based software quality evaluation.

General Objective

To develop and evaluate a web-based Automotive Laboratory Inventory and Resource Management System for the Bachelor of Science in Automotive Technology program at Surigao del Norte State University.

Specific Objectives

To determine the functional and operational requirements for an Automotive Laboratory Inventory and Resource Management System through an assessment of the existing inventory management practices of the Bachelor of Science in Automotive Technology program at Surigao del Norte State University.

To design and develop a web-based Automotive Laboratory Inventory and Resource Management System with modules for inventory management, laboratory equipment monitoring, borrowing and return transactions, user management, and report generation.

To evaluate the quality of the developed system using the ISO/IEC 25010 Software Quality Model in terms of:

- Functional Suitability
- Performance Efficiency
- Compatibility
- Usability
- Reliability
- Security
- Maintainability

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

- Portability

To determine the level of acceptability of the developed system among Automotive Technology faculty members, laboratory custodians, and students in terms of its usefulness, ease of use, efficiency, and overall user satisfaction.

III. METHODOLOGY

A. Research Design

This study employed a **Design and Development Research (DDR)** approach to develop and evaluate a Web-Based Automotive Laboratory Inventory and Resource Management System for the Bachelor of Science in Automotive Technology program at Surigao del Norte State University. Design and Development Research is an appropriate methodology for creating technological solutions that address real-world problems through systematic analysis, design, development, implementation, and evaluation. The methodology ensures that the developed system is responsive to user requirements while complying with internationally recognized software quality standards.

The study consisted of four major phases: (1) Requirements Analysis, (2) System Design, (3) System Development and Implementation, and (4) System Evaluation.

Phase 1: Requirements Analysis

The first phase focused on identifying the functional and operational requirements of the proposed system. Data were gathered through interviews with Automotive Technology faculty members, laboratory custodians, and designated personnel responsible for inventory management. Existing inventory procedures, borrowing processes, equipment monitoring practices, and report generation methods were examined to identify operational challenges and system requirements.

The collected information served as the basis for defining the system specifications, user requirements, functional requirements, and non-functional requirements.

Phase 2: System Design

Based on the identified requirements, the architecture of the proposed system was designed. This phase included the preparation of system models such as the Context Diagram, Use Case Diagram, Data Flow Diagram (DFD), Entity-Relationship Diagram (ERD), database schema, and user interface prototypes.

The system architecture was designed using a three-tier architecture consisting of the presentation layer, application layer, and database layer to ensure scalability, maintainability, and efficient data processing.

Phase 3: System Development and Implementation

The proposed system was developed as a web-based application using modern web technologies. The development process included database creation, module development, system integration, testing, and deployment.

The developed system included the following functional modules:

- User Authentication and Access Control
- Inventory Management
- Equipment and Tool Registration
- Stock-In and Stock-Out Monitoring
- Borrowing and Return Management
- Supplier Management
- Report Generation
- Dashboard and Inventory Analytics
- Low Stock Notification

After development, functional testing and integration testing were conducted to verify that all modules operated according to the specified requirements before implementation in the Automotive Technology Laboratory.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

Phase 4: System Evaluation

The developed system was evaluated using the **ISO/IEC 25010 Software Quality Model**. The evaluation focused on the following software quality characteristics:

- Functional Suitability
- Performance Efficiency
- Compatibility
- Usability
- Reliability
- Security
- Maintainability
- Portability

A structured evaluation questionnaire based on the ISO/IEC 25010 criteria was administered to the identified respondents. The responses were analyzed to determine the quality and acceptability of the developed system.

C. Research Locale

The study was conducted at the Bachelor of Science in Automotive Technology program of Surigao del Norte State University, where the proposed system was implemented and evaluated.

D. Respondents of the Study

The respondents consisted of Automotive Technology faculty members, laboratory custodians, and selected students who regularly utilized the Automotive Technology Laboratory. These respondents were selected because they are the primary users and beneficiaries of the proposed inventory management system.

E. Research Instrument

The primary research instrument consisted of:
Interview Guide for requirements gathering;
Observation Checklist for documenting existing inventory procedures; and
ISO/IEC 25010-based Evaluation Questionnaire for assessing the developed software.
Prior to administration, the evaluation instrument may be subjected to expert validation to ensure its clarity, relevance, and suitability for evaluating the developed system.

F. Data Gathering Procedure

The data gathering procedure involved the following steps:

- Secure approval from the University and the Automotive Technology Department.
- Conduct interviews and observations to identify user requirements.
- Design the system architecture and database.
- Develop and test the proposed web-based inventory management system.
- Deploy the system within the Automotive Technology Laboratory.
- Conduct system evaluation using the ISO/IEC 25010 evaluation instrument.
- Analyze and interpret the collected data.

G. Statistical Treatment of Data

Descriptive statistics were used to analyze the evaluation results.
Specifically, the **Weighted Mean** and **Standard Deviation** were computed to determine the respondents' assessment of the developed system based on the ISO/IEC 25010 software quality characteristics.
Table I
The weighted mean was interpreted using the following five-point Likert scale:

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 5, December 2025
Impact Factor: 7.67

Scale	Descriptive Interpretation
4.21–5.00	Excellent
3.41–4.20	Very Good
2.61–3.40	Good
1.81–2.60	Fair
1.00–1.80	Poor

The statistical analyses were performed to determine the overall quality and acceptability of the developed Automotive Laboratory Inventory and Resource Management System.

IV. RESULTS AND DISCUSSION

4.1 Functional and Operational Requirements

The functional and operational requirements of the proposed Automotive Laboratory Inventory and Resource Management System were identified through interviews, observations, and an assessment of the existing inventory management practices of the Bachelor of Science in Automotive Technology program at Surigao del Norte State University. The assessment revealed that inventory recording, equipment monitoring, borrowing and return transactions, and report generation were predominantly performed using manual logbooks and spreadsheet files. These practices resulted in time-consuming processes, inconsistent inventory records, and difficulty in monitoring laboratory resources.

The identified requirements served as the basis for the design and development of the proposed system.

Table II

Functional and Operational Requirements of the Proposed Automotive Laboratory Inventory and Resource Management System

Requirement Category	Identified Requirement	Purpose
User Authentication	Secure login with role-based access	Restrict unauthorized access to the system
Inventory Management	Registration and updating of automotive tools, equipment, spare parts, and consumables	Maintain accurate inventory records
Equipment Management	Monitoring of equipment condition, availability, and storage location	Improve laboratory resource utilization
Borrowing and Return	Recording of borrowing and return transactions	Track equipment accountability
Stock-In and Stock-Out	Automatic updating of inventory quantities	Maintain accurate stock balances
Supplier Management	Recording supplier information and procurement details	Support inventory replenishment
Low-Stock Notification	Automatic alert when inventory reaches the reorder level	Prevent stock shortages
Report Generation	Generation of daily, monthly, semester, and annual inventory reports	Support inventory auditing and decision-making
User Management	Administration of user accounts and user privileges	Ensure proper system administration

Table II summarizes the functional and operational requirements identified during the assessment. These requirements formed the foundation for the design, development, and implementation of the proposed Automotive Laboratory Inventory and Resource Management System. The identified functionalities address the limitations of the existing manual inventory process by providing automated inventory recording, equipment monitoring, transaction management, and report generation, thereby improving the efficiency and accuracy of laboratory resource management.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

4.2 Design and Development of the System

The Web-Based Automotive Laboratory Inventory and Resource Management System was successfully developed for the Bachelor of Science in Automotive Technology program at Surigao del Norte State University. The system was designed to improve the management of laboratory resources by automating inventory transactions, equipment monitoring, borrowing and return processes, report generation, and user management as reflected in Figure 1.

The system consists of several integrated modules, namely: (1) User Authentication, (2) Dashboard, (3) Inventory Management, (4) Equipment Management, (5) Borrowing and Return Management, (6) Stock-In and Stock-Out Management, (7) Supplier Management, (8) Report Generation, and (9) User Account Management.

The dashboard provides real-time information on the total number of inventory items, available laboratory equipment, borrowed tools, returned equipment, low-stock items, and recent inventory transactions. These features enable laboratory personnel to efficiently monitor inventory status and make timely decisions regarding procurement and laboratory resource allocation.

The inventory management module allows administrators to register new automotive tools, laboratory equipment, spare parts, and consumable materials. Each inventory item is assigned a unique inventory identification number with complete descriptive information, including category, quantity, storage location, condition, acquisition date, and reorder level.

The borrowing and return module records all equipment transactions performed by students and faculty members. The system automatically updates inventory status whenever laboratory resources are borrowed or returned, thereby improving accountability and minimizing inventory discrepancies.

Furthermore, the report generation module enables administrators to generate daily, weekly, monthly, and annual inventory reports. These reports support laboratory management, accreditation activities, inventory auditing, and procurement planning.

Figure 1. System Dashboard

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

4.3. Evaluation of the Developed System Based on ISO/IEC 25010

The developed system was evaluated using the ISO/IEC 25010 Software Quality Model. Faculty members, laboratory custodians, and selected Automotive Technology students participated in the evaluation.

Table III

Evaluation of the Developed System Based on ISO/IEC 25010

ISO/IEC 25010 Characteristic	Mean	Standard Deviation	Interpretation
Functional Suitability	4.82	0.32	Excellent
Performance Efficiency	4.76	0.36	Excellent
Compatibility	4.74	0.35	Excellent
Usability	4.88	0.27	Excellent
Reliability	4.80	0.30	Excellent
Security	4.73	0.38	Excellent
Maintainability	4.77	0.33	Excellent
Portability	4.79	0.31	Excellent
Overall Mean	**4.79**	**0.33**	**Excellent**

The evaluation results indicate that the developed system obtained an overall mean score of **4.79**, which corresponds to an **Excellent** rating. This finding suggests that the system satisfies the software quality characteristics specified in the ISO/IEC 25010 standard.

Among the evaluated criteria, **Usability** obtained the highest mean score (M = 4.88), indicating that respondents found the system easy to learn, navigate, and operate. The intuitive user interface, organized menu structure, and simplified inventory processes contributed to this favorable assessment.

Functional Suitability received a mean score of 4.82, demonstrating that the developed system successfully performs the required inventory management functions. Respondents confirmed that the application accurately records inventory transactions, updates stock levels, monitors laboratory equipment, and generates inventory reports.

The system also achieved high ratings in **Reliability** (M = 4.80), indicating that it consistently performs inventory transactions without significant operational errors. During the implementation period, the system maintained stable performance while processing inventory records and generating reports.

Similarly, **Performance Efficiency** obtained a mean score of 4.76, suggesting that the system responds quickly to user requests while efficiently processing inventory information. The centralized database architecture minimized processing delays and supported efficient retrieval of laboratory records.

The **Compatibility** rating (M = 4.74) demonstrates that the developed application can operate across commonly used web browsers and computing devices within the university environment.

The **Security** criterion obtained a mean score of 4.73. Respondents acknowledged that the implementation of user authentication, role-based access control, and secured login procedures enhanced the protection of inventory information from unauthorized access.

Furthermore, **Maintainability** (M = 4.77) indicates that the software architecture facilitates future system modifications, feature enhancements, and maintenance activities. Likewise, **Portability** (M = 4.79) suggests that the developed application can be deployed in different computer systems with minimal configuration.

4.4 Level of Acceptability of the Developed System

The level of acceptability of the developed Automotive Laboratory Inventory and Resource Management System was evaluated by Automotive Technology faculty members, laboratory custodians, and selected students of Surigao del Norte State University. The evaluation focused on the system's usefulness, ease of use, efficiency, and overall user satisfaction.

Table IV

Level of Acceptability of the Developed System

Acceptability Indicator	Mean	Standard Deviation	Interpretation
Usefulness	4.86	0.29	Highly Acceptable

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

Ease of Use	4.89	0.25	Highly Acceptable
Efficiency	4.81	0.31	Highly Acceptable
Overall User Satisfaction	4.88	0.27	Highly Acceptable
Overall Mean	**4.86**	**0.28**	**Highly Acceptable**

As presented in Table IV, the developed Automotive Laboratory Inventory and Resource Management System obtained an overall mean rating of **4.86** (SD = **0.28**), interpreted as **Highly Acceptable.** Among the evaluated indicators, **Ease of Use** received the highest mean score (**M = 4.89**), indicating that respondents found the system intuitive, user-friendly, and easy to navigate. This was followed by **Overall User Satisfaction (M = 4.88**), suggesting that users were satisfied with the system's overall performance and functionality.

Similarly, **Usefulness** obtained a mean score of **4.86**, indicating that respondents perceived the system as beneficial in improving inventory management, monitoring laboratory resources, and generating inventory reports. **Efficiency** also received a high mean rating (**M = 4.81**), demonstrating that the system reduced the time and effort required to perform inventory-related tasks compared with the previous manual procedures.

Overall, the findings indicate that the developed system was highly accepted by its intended users. The positive evaluation demonstrates that the system effectively supports inventory management activities within the Automotive Technology Laboratory and has the potential to enhance operational efficiency, accountability, and resource utilization at Surigao del Norte State University.

4.5 Summary

This study developed and evaluated a **Web-Based Automotive Laboratory Inventory and Resource Management System** for the Bachelor of Science in Automotive Technology program at Surigao del Norte State University. The study adopted a Design and Development Research (DDR) approach to address the limitations of the existing manual inventory management practices.

The assessment of the current inventory system revealed that inventory recording, equipment monitoring, borrowing and return transactions, and report generation were primarily managed using manual logbooks and spreadsheet files. These practices resulted in inefficient inventory monitoring, inconsistent records, time-consuming report preparation, and difficulty in tracking laboratory resources. Consequently, the identified functional and operational requirements served as the basis for designing and developing the proposed system.

The developed system integrated nine major modules: User Authentication, Dashboard, Inventory Management, Equipment Management, Borrowing and Return Management, Stock-In and Stock-Out Management, Supplier Management, Report Generation, and User Account Management. These modules automated inventory transactions, improved equipment monitoring, facilitated report generation, and enhanced the overall management of automotive laboratory resources.

The developed system was evaluated using the ISO/IEC 25010 Software Quality Model. The evaluation yielded an overall mean score of **4.79 (SD = 0.33)**, interpreted as **Excellent**, indicating that the system satisfied the international software quality standards in terms of functional suitability, performance efficiency, compatibility, usability, reliability, security, maintainability, and portability.

Furthermore, the level of acceptability of the system was assessed among Automotive Technology faculty members, laboratory custodians, and students. The system obtained an overall mean score of **4.86 (SD = 0.28)**, interpreted as **Highly Acceptable**, demonstrating that respondents perceived the system as useful, easy to use, efficient, and satisfactory for managing laboratory inventory and resources.

V. CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

The existing inventory management practices of the Automotive Technology Laboratory relied heavily on manual processes, resulting in inefficiencies in inventory recording, equipment monitoring, borrowing and return management, and report generation. These findings justified the need for a computerized inventory management system.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429 Volume 5, Issue 5, December 2025 Impact Factor: 7.67

The developed Web-Based Automotive Laboratory Inventory and Resource Management System successfully addressed the identified functional and operational requirements by integrating inventory management, equipment monitoring, borrowing and return management, stock control, supplier management, report generation, and user administration into a centralized web-based platform.

The developed system demonstrated excellent software quality based on the ISO/IEC 25010 Software Quality Model, confirming that it is functionally suitable, reliable, efficient, secure, maintainable, compatible, and portable for deployment in the Automotive Technology Laboratory.

The system achieved a highly acceptable level of user acceptance among faculty members, laboratory custodians, and students, indicating that it effectively improves inventory management, enhances operational efficiency, promotes accountability, and supports better utilization of laboratory resources.

Recommendations

Based on the findings and conclusions of the study, the following recommendations are proposed:

The Bachelor of Science in Automotive Technology program of Surigao del Norte State University may adopt the developed Web-Based Automotive Laboratory Inventory and Resource Management System to improve inventory control, equipment monitoring, and laboratory operations.

The university may integrate the system with other institutional information systems, such as procurement, property management, and accounting systems, to establish a centralized asset and inventory management platform.

Future enhancements of the system may include the integration of barcode or QR code scanning, RFID-based asset identification, automated email or SMS notifications, preventive maintenance scheduling, and mobile application support to further improve system functionality and user convenience.

Future researchers may validate the system in other higher education institutions offering Automotive Technology or related technical programs and evaluate its effectiveness using larger respondent groups and additional software quality or technology acceptance models to further establish its applicability and generalizability.

ACKNOWLEDGMENT

The researchers express their sincere gratitude to Almighty God for His guidance, wisdom, and countless blessings throughout the completion of this study.

The researchers also extend their heartfelt appreciation to all individuals and institutions who provided their support, encouragement, and valuable assistance during the conduct of this research. Special thanks are given to the faculty members, respondents, and everyone who shared their time, expertise, and cooperation, which greatly contributed to the successful completion of this study.

Finally, the researchers are deeply grateful to their families and friends for their unwavering love, understanding, patience, and encouragement throughout this academic endeavor.

REFERENCES

1. Cortez, R. R., Meneses, J. L. R., & Tan, J. B. (2024). *Design and Development of Laboratory Inventory Management System (LIMS).* MSEUF Research Studies.
2. Wulandari, B., & Rahman, D. F. (2026). *Development and ISO/IEC 25010 Evaluation of a Web-Based Laboratory and Workshop Inventory System.* Jurnal Ilmiah Ilmu Terapan Universitas Jambi.
3. Odasco, B. T., & Saong, M. M. (2023). Analysis of the inventory management system towards enhanced university service delivery. *International Institute of Advanced Research and Innovation.*
4. Ramos-Miller, M. (2023). Towards inventory control excellence: An innovative approach to inventory management in educational institutions. *Healthcare*, 12(5).
5. International Organization for Standardization. (2023). *ISO/IEC 25010:2023 Systems and software engineering—Systems and software Quality Requirements and Evaluation (SQuaRE).*
6. Biso, F. M. P., et al. (2025). *ALIBS: Automated Laboratory Inventory and Borrowing System Using RFID Technology for the CPU ECE Laboratories.* Central Philippine University.

IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 5, December 2025
Impact Factor: 7.67

7. SAP. (2024). *Inventory management.*
8. Oracle NetSuite. (2024). *Inventory management guide.*
9. Agboola, F. F., Malgwi, Y. M., Mahmud, M. A., & Oguntoye, J. P. (2022). Development of a web-based platform for automating inventory management of small and medium enterprises.
10. Ahmed, E. (2024). *Inventory Management.* IntechOpen.
11. Dayday, J. E. C., Masulot, M. M., Panes, C. S., & Pilapil, J. B. O. (2013). Inventory Management System with Reorder Triggered SMS Alert.
12. Abbott, A. (2019). Developing a decision support system for inventory management in an auto parts manufacturer.
13. Lopienski, K. (2024). Inventory forecasting methods.
14. Vatovec Krmac, E. (2011). Intelligent value chain networks and inventory information systems.
15. Nicasio, F. (2021). Preventable causes of inventory stock-outs.
16. Ahmed, E. (2024). *Inventory management*. IntechOpen.
17. Tong, C. (2023). *An efficient intelligent semi-automated warehouse inventory stocktaking system*. arXiv.
18. Yang, X., Liu, Z., Jiang, W., Zhang, C., Zhao, L., Song, L., & Bian, J. (2023). *A versatile multi-agent reinforcement learning benchmark for inventory management*. arXiv.
19. Al-Fedaghi, S., & Al-Huwais, N. (2018). Conceptual modeling of inventory management processes as a Thinging Machine. *arXiv*.
20. Tanaman, R., et al. (2023). Web-based inventory management system for institutional applications. *International Journal of Science and Advanced Information Technology*.
21. Cortez, R. R., Meneses, J. L. R., & Tan, J. B. (2024). Design and Development of Laboratory Inventory Management System (LIMS). *MSEUF Research Studies*.
22. Odasco, B. T., & Saong, M. M. (2023). Analysis of the inventory management system towards enhanced university service delivery. *International Institute of Advanced Research and Innovation*.
23. Wulandari, B., & Rahman, D. F. (2026). Development and ISO/IEC 25010 evaluation of a web-based laboratory and workshop inventory system.
24. International Organization for Standardization. (2023). *ISO/IEC 25010: Systems and software engineering—Systems and software Quality Requirements and Evaluation (SQuaRE).*
25. Biso, F. M. P., et al. (2025). *ALIBS: Automated Laboratory Inventory and Borrowing System Using RFID Technology for Engineering Laboratories.*